

A new enigmatic genus of the ichneumonid subfamily Ctenopelmatinae (Hymenoptera, Ichneumonidae) from Thailand

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Abstract

The Ctenopelmatinae is one of the least explored groups of Ichneumonidae in South East Asia. We describe and illustrate an enigmatic new genus, *Thaictenopelma* Ranjith, Reshchikov & Quicke with the type species, *T. splendida* Ranjith, Reshchikov & Quicke, **sp. nov.**, from a moderately high altitude site in northern Thailand. The new genus shows a unique set of morphological characters that distinguishes it from all other ctenopelmatine genera. The presence of a pair of complete latero-median as well as complete dorso-lateral carinae on the T2 are considered autapomorphic characters of the new genus. Affinities of the new genus within the Ctenopelmatinae are discussed and a note on the taxonomic placement is provided.

Keywords

Malaise trap, new species, parasitoid wasp, South East Asia, taxonomy

Introduction

The ichneumonid subfamily Ctenopelmatinae consists of more than 1,500 species belonging to 113 genera (Yu et al. 2016; Broad et al. 2018; Li et al. 2022; Reshchikov et al. 2022). The subfamily is currently divided into nine tribes (Broad et al. 2018), but

its tribal classification is not stable (Gauld et al. 1997; Bennett et al. 2019) and it has never been recovered as monophyletic in phylogenetic analyses (Quicke et al. 2009; Bennett et al. 2019), possibly being paraphyletic with respect to Mesochorinae, Metopiinae, Oxytorinae and Tatogastrinae (Quicke et al. 2009; Quicke 2015). The most important characters of ctenopelmatines are the presence of an acute dorsal tooth on the apex of the fore tibia and a dorsal, subapical notch on the ovipositor of most species, although it is needle-like and lacking the notch in its egg-larval parasitoid members (most Pionini) (Cameron et al. 2014) as well as in species of some other genera, for example, *Lathrolestes* Förster (Reshchikov et al. 2010). In other respects, ctenopelmatines exhibit a wide spectrum of morphological characters (Townes 1970; Gauld 1984, Gauld et al. 1997). Species of Ctenopelmatinae are koinobiont endoparasitoids of sawfly (Hymenoptera) larvae and exceptionally of Lepidoptera caterpillars (Seyrig 1928; Heath 1961) and Coleoptera larvae (Barron 1994; Broad et al. 2018).

The known Oriental fauna of Ctenopelmatinae comprises 84 species belonging to 29 genera (Yu et al. 2016; Reshchikov et al. 2017a, b, 2022; Reshchikov and van Achterberg 2018; Li et al. 2022). However, since their host sawflies are a predominantly temperate group, it is unsurprising that they are particularly uncommon in tropical regions where they are predominantly restricted to montane areas (Malaise 1945; Gauld 1997; Reshchikov 2015; Reshchikov et al. 2018). The South East Asian fauna is particularly poorly known with the only published records being for *Gilen* Reshchikov & van Achterberg, 2018, *Metopheltes* Uchida, 1932, *Neurogenia* Roman, 1910, *Rhytidaphora* Reshchikov & Quicke, 2022 and *Rhorus* Förster, 1869 (Reshchikov et al. 2017a; Butcher and Quicke 2023), although we have seen specimens of *Scolobates* Gravenhorst, 1829 from Thailand. Of these, both *Gilen* and *Rhytidaphora* were described within the past decade, and the possibility that the recently described Chinese genus, *Unicarinata* Sheng, Li & Sun, 2022 might also occur in the region cannot be neglected.

Here we describe an enigmatic new genus and a species, *Thaictenopelma* Ranjith, Reshchikov & Quicke (type species: *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke sp. nov.) from Doi Pha Hom Pok and Doi Phu Kha National Parks, both located in northern Thailand. In *Thaictenopelma* gen. nov., T2 has a pair of complete latero-median carinae as well as complete dorso-lateral carinae which is a unique combination not present in any other members of the subfamily. The new genus and species are described and comprehensively illustrated photographically, and taxonomic placement of the new genus is discussed.

Methods

All specimens were collected using Malaise traps set up as part of (i) two-year long sampling programme at Doi Phu Kha (2018 and 2022) (ii) from the two year long TIGER sampling programme 2007–2008 across Thailand (for habitat photo see Suppl. material 1), (iii) from Twin Peaks Project, and (iv) Tea Fauna Project (www.teafauna.com) sampling in northern Thailand. In total more than 600 trap months' worth of catches were sorted.

Images were acquired digitally using the Leica M205 C stereomicroscope with a DMC5400 Camera, stacked in LASX (ver. 3.7.4.23463). Images processed later in Adobe Photoshop.

List of repositories

CUMZ Chulalongkorn University Museum of Natural History, Bangkok, Thailand

QSBG Queen Sirikit Botanic Garden, Chiang Mai, Thailand

Morphological terminology follows Broad et al. (2018) and for cuticular sculpture we follow Harris (1979) and is aligned with the Hymenoptera Anatomy Ontology (HAO) (Yoder et al. 2010).

Morphological abbreviations used

F1	antennal flagellomere 1
OD	the longest diameter of a posterior lateral ocellus
OOL	the shortest distance between a posterior lateral ocellus and a compound eye
POL	the shortest distance between the posterior lateral ocelli
S1–7	refers to the metasomal sternites 1–7
T1–T7	refers to the metasomal tergites 1–7

Results

Taxonomy

Thaictenopelma Ranjith, Reshchikov & Quicke, gen. nov.

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Figs 1–5, see Suppl. material 2

Type species. *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke gen. et sp. nov.

Diagnosis. *Thaictenopelma* gen. nov. can be separated from all other ctenopelmatine genera by its putatively autapomorphic carination pattern of T1 and T2. In particular, the pairs of complete latero-median and dorso-lateral carinae on T2 are completely unknown for the subfamily (Townes 1970). Additionally, the new genus can be distinguished from other ctenopelmatines by a combination of characters viz., the lower tooth of mandible being longer than upper tooth, propodeum with distinct carination, fore wing with rhombic areolet, T2 and T3 with posteriorly diverging groove basally, and T3 with distinct medio-basal protuberances.

Description. Female. Head. Eyes glabrous (Fig. 1B, C). Clypeus flat separated from face only by series of punctures (clypeal groove indistinct to absent), apical margin slightly concave (Fig. 1B). Mandible bidentate, lower tooth longer than up-

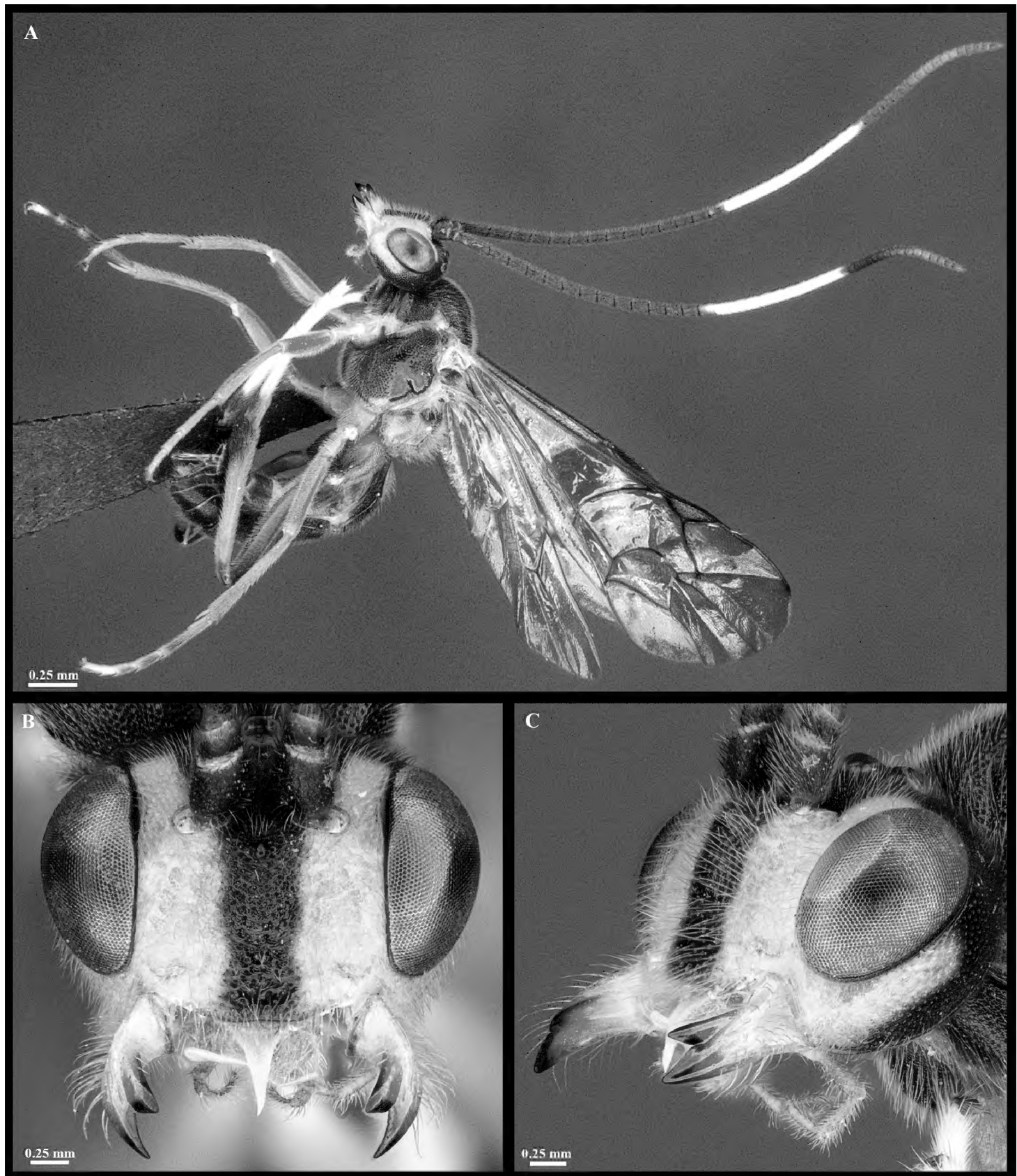


Figure 1. *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke, gen. et sp. nov., holotype, female **A** habitus, lateral view **B** head, anterior view **C** head, antero-lateral view.

per tooth, the former more acute (Fig. 1B, C). Face with a short protuberance between antennal sockets (Fig. 1B). Malar space short, subocular sulcus absent (Figs 1B, C, 2B). Occipital carina complete (Fig. 2A, B, Suppl. material 2), joining with hypostomal carina just above base of mandible (Fig. 2B). Ocellar triangle with broad base, anterior ocellus slightly larger than posterior ocellus (Fig. 2A). Frons anteriorly depressed without median sulcus or carina (Fig. 2A). Terminal antennomere acute (Fig. 1A).

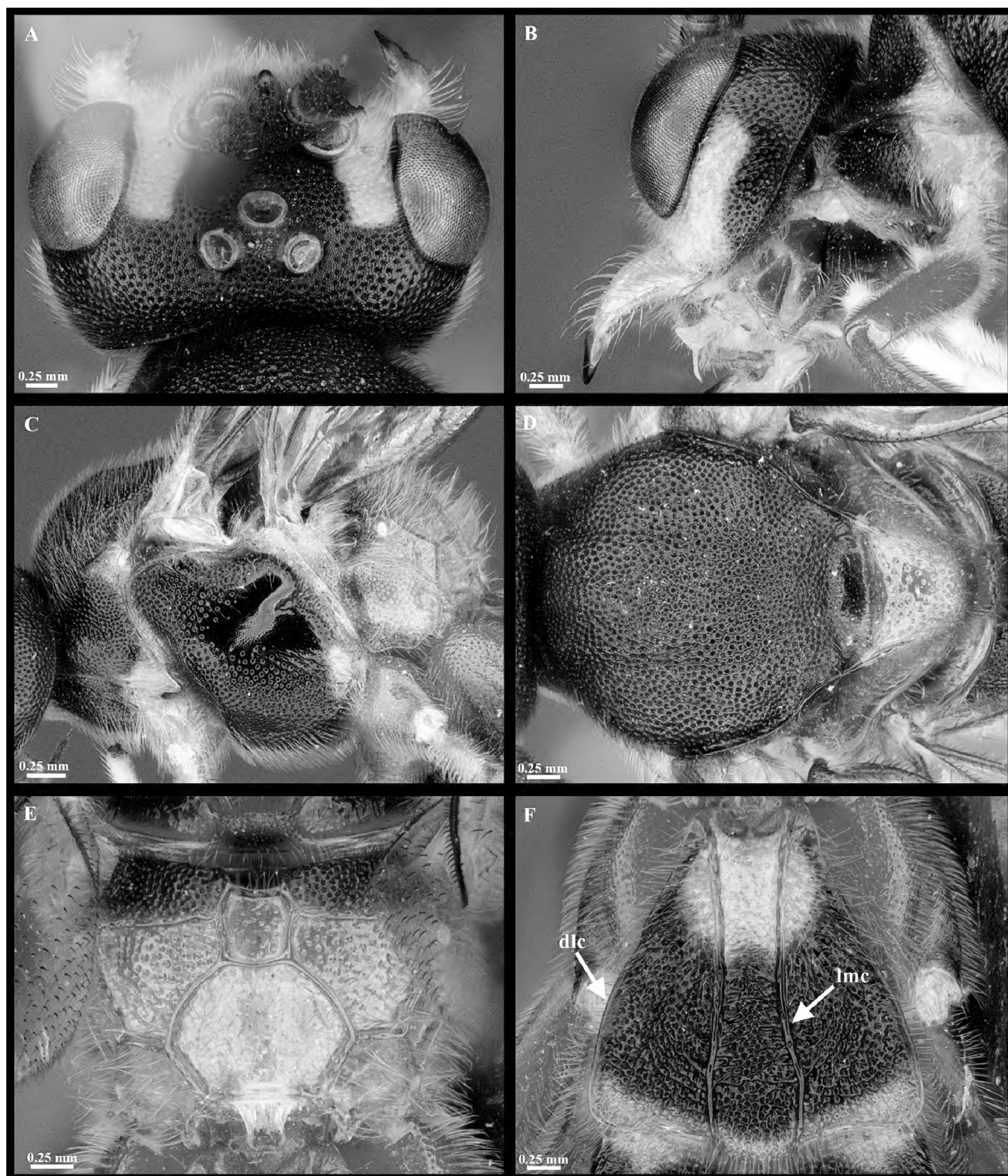


Figure 2. *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke, gen. et sp. nov., holotype, female **A** head, dorsal view **B** head, ventro-lateral view **C** mesosoma, lateral view **D** mesosoma, dorsal view **E** propodeum, dorsal view **F** T1, dorsal view. Abbreviations: dlc, dorso-lateral carina, lmc, latero-median carina.

Mesosoma. Mesosoma longer than high, setose (Fig. 2C). Epomia absent (Fig. 2C). Mesoscutum closely punctate (Fig. 2D). Notauli slightly impressed anteriorly, largely absent posteriorly (Fig. 2D). Mesopleuron closely punctate, smooth medially including speculum (Fig. 2C). Epicnemial carina extending to half height, not joining anterior margin of mesopleuron (Fig. 2C), complete ventrally (see Suppl. material 2). Scuto-scutellar groove smooth, not divided (Fig. 2D). Scutellum slightly bulged in lat-



Figure 3. *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke, gen. et sp. nov., holotype, female **A** metasoma, lateral view **B** T1, lateral view **C** T2–4, dorsal view. Abbreviations: dlc, dorso-lateral carina, lmc, latero-median carina, vlc, ventro-lateral carina.

eral view, lateral scutellar carina present only anteriorly (Fig. 2D). Metanotum closely punctate medially, with irregular wrinkles laterally (Fig. 2E). Metapleuron punctate, setose, submetapleural carina strong forming distinct lobe anteriorly, juxtacoxal carina absent (Fig. 2C). Posterior transverse carina complete ventrally. Propodeum with distinct carinae, area basalis transverse, area superomedia hexagonal, as long as wide, smooth, area externa transverse, closely punctate, area dentipara subtriangular, closely

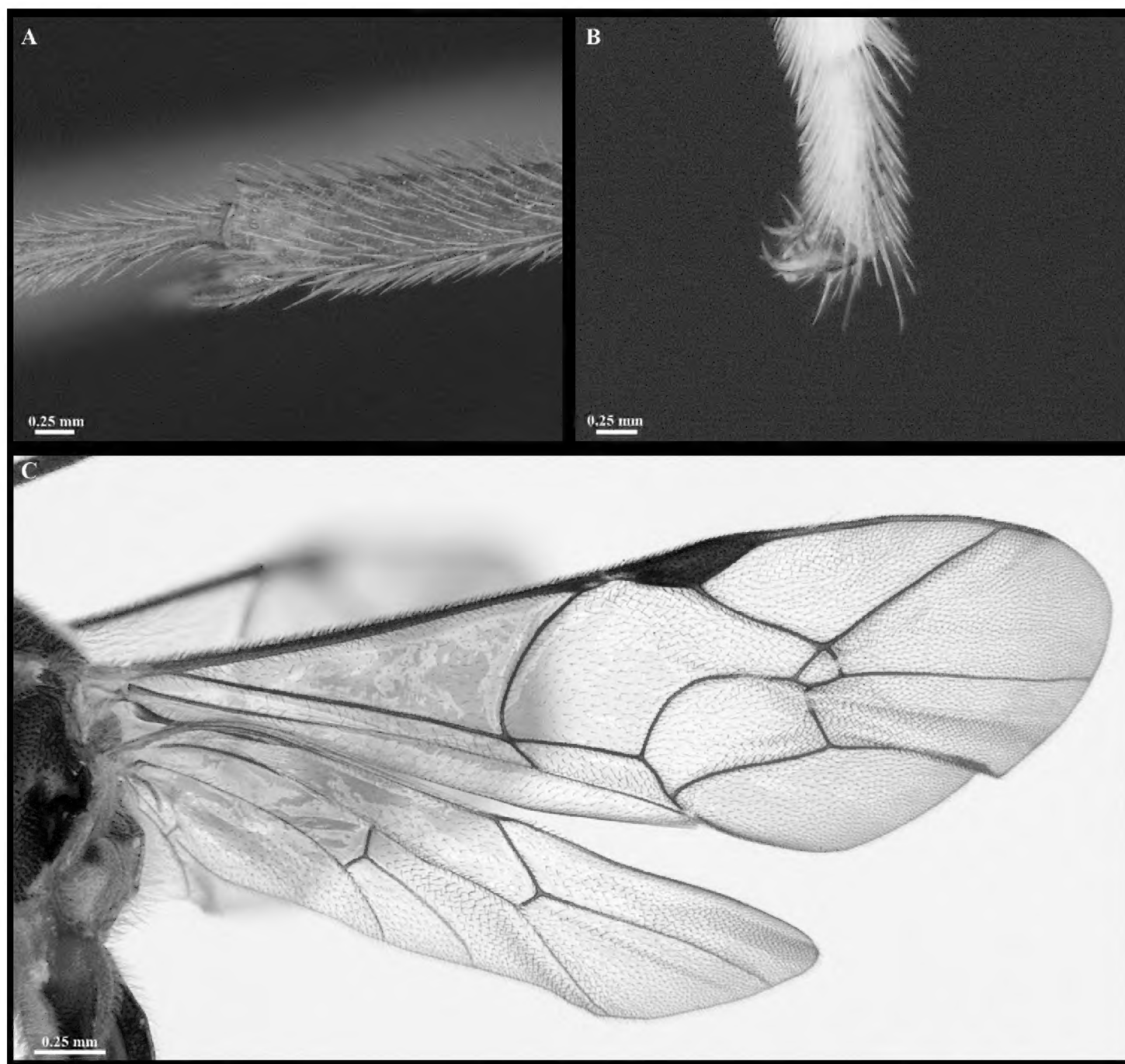


Figure 4. *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke, gen. et sp. nov., holotype, female **A** apex of fore tibia, lateral view **B** tarsal claw, lateral view **C** wings.

punctate, setose, area petiolaris hexagonal, smooth, setose, area posteroexterna smooth, setose, anterior and posterior transverse carinae present, complete, pleural and lateral longitudinal carinae present, spiracle oval (Fig. 2E).

Wings. Fore wing with rhombic areolet (Fig. 4C). Vein 2r&RS originating from the middle of pterostigma (Fig. 4C). Vein 2m-cu with single, rather wide bulla, joining areolet medially (Fig. 4C). Vein 1cu-a interstitial and declivous (Fig. 4C). Vein CU originating below middle of first subdiscal cell (Fig. 4C). Hind wing with CU&cu-a receiving distal abscissa of CU at middle (Fig. 4C).

Legs. Fore tibia with acute lobe apically, with short spine on dorsal margin (Fig. 4A). Fore and mid coxae smooth, hind coxa punctate (Figs 1A, 3A). Tarsal claw sparsely pectinate to middle (Fig. 4B).

Metasoma. Metasoma coarsely punctate (Figs 2E, 3). T1 setose, transversely, coarsely rugose punctate with dorso-lateral carina (dmc) and latero-median carina (lmc) com-

plete to apex, latero-median carinae with a trace of transverse carina extending laterally at apical $2/3^{\text{rd}}$, ventro-lateral carina (vlc) present, complete, glymma present basally extending dorsally to join basal depression of tergite (not extending horizontally so that both glymmae are only separated from the dorsal depression by a thin, translucent partition), baso-dorsal depression separated by longitudinal tubercle, posterior margin of T1 convex medially, spiracle located slightly anterior to mid-length (Figs 2F, 3A, B). S1 present in basal $1/4^{\text{th}}$, divided from T1 posteriorly (Fig. 3A, B). T2 coarsely punctate with dorso-lateral and latero-median carinae with a trace of transverse carina extending laterally at apical $2/3^{\text{rd}}$, pair of posteriorly diverging grooves present baso-laterally, spiracle situated at basal $1/3^{\text{rd}}$ below lateral longitudinal carina, setose posteriorly (Fig. 3A, C). T3 punctate to rugose punctate (less coarse than T2) with posteriorly diverging groove baso-laterally and a pair of protuberances medio-basally, sparsely setose medially and distinctly setose posteriorly (Fig. 3C). T4–7 closely punctate (less coarse than T3) without carinae, setose (Fig. 3A, C). Ovipositor sheath setose (Fig. 3A). Ovipositor with distinct dorsal notch, without dorsal nodus dorso-apically (Fig. 3A, Suppl. material 2).

Etymology. The generic name derived from a combination of ‘*Thai*’ for Thailand and ‘*Ctenopelma*’, type genus of the subfamily Ctenopelmatinae.

Distribution. Thailand.

Species included. The genus is described as monotypic.

***Thaictenopelma splendida* Ranjith, Reshchikov & Quicke, sp. nov.**

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Type material. Holotype. THAILAND • ♀, Nan Province, Doi Phu Kha National Park; 19°12.236'N, 101°04.667'E, altitude 1,341 m.a.s.l. 5–6 July 2022, Malaise trap, Worapong Atsawasiramanee leg.; Malaise trap (CUMZ). **Paratypes:** THAILAND • 2♂, Thailand, Nan province, Pua district, Doi Phu Kha National Park, 19°10.450'N, 101°06.370'E alt. 1677 m, 7–20.ix.2018, Malaise trap, coll. Worapong Atsawasiramanee (CUMZ); 1♀, Chiang Mai Province, Doi Pha Hom Pok National Park, Doi Pha Luang; 20°1.06'N, 99°9.581'E, altitude 1,449 m.a.s.l., 27 Jul. – 3 Aug. 2007, Malaise trap, T2932, Wongchai P. leg.; (QSBG); 1♀ & 1♂; same sampling data but 3–10 Aug. 2007, T2931, Wongchai P. leg. (QSBG); 1♂ same sampling data but 7–14 Oct. 2007, T6209, Wongchai P. leg.; (QSBG).

Description. Female (holotype): Body length 8.5 mm, fore wing length 7.8 mm.

Head. Antenna with 42 flagellomeres, all longer than wide, flagellomeres narrowing towards apex, F1 1.5 × as long as F2, F1 & F2 2.4, 1.8 × as long as wide, respectively. Scape approximately as long as maximally wide (Fig. 1B). Head transverse 1.5 × as wide as high in anterior view, 1.8 × as wide as long in dorsal view. Face transverse, flat, distinctly punctate with granulate interspace, setose, 2.0 × as long as wide (Fig. 1B). Inner margin of eyes parallel (Fig. 1B). Clypeus transverse, 3.5 × as long as wide, separated from face by distinct suture (Fig. 1B). Malar space 0.4 × as long as basal width of mandible. Lower tooth of mandible 1.6 × as long as upper tooth. Gena 0.6 × as long

as eye in lateral view, $0.7 \times$ as long as transverse diameter of eye in dorsal view. Frons distinctly punctate with granulate interspace, setose (Fig. 2A). OOL $2.1 \times$ OD; OOL $1.9 \times$ POL. Vertex and occiput distinctly punctate with granulate interspaces (Fig. 2A).

Mesosoma. Mesosoma $1.4 \times$ as long as high. Pronotum rugose punctate with indistinct groove laterally, setose (Fig. 2C). Propleuron distinctly punctate, setose (Fig. 2C). Scutellum $0.7 \times$ as long as wide, moderately punctate with smooth interspace, setose (Fig. 2D). Propodeum with area superomedia $1.0 \times$ as long as wide, anterior transverse carina straight laterally, lateral extension of posterior transverse carina distinctly curved (Fig. 2E).

Wings. Pterostigma $3.4 \times$ as long as wide. Fore wing areolet $0.8 \times$ as long as maximum width. Vein 2rs-m $1.5 \times$ as long as 3rs-m.

Legs. Hind femur, tibia and basitarsus 5.4, 5.7, $5.9 \times$ as long as its maximum width, respectively.

Metasoma. T1 $1.0 \times$ as long as its maximum width. T2 $0.7 \times$ as long as its maximum width. T2 $1.1 \times$ as long as T3. T3 $0.6 \times$ as long as its maximum width. Ovipositor sheath $0.2 \times$ as long as hind basitarsus.

Coloration. Body mostly black except the following yellow: face and clypeus except medially, mandible except apically, gena postero-basally, frons laterally, pronotum antero- and postero-laterally, mesopleuron posteriorly, scutellum, axilla, metanotum mediobasally and postero-laterally, metapleuron except anterior blackish patch, propodeum except area externa, fore leg, mid coxa, mid femora, mid tibia, mid basitarsus except apically, hind coxa dorsally and baso-ventrally, hind tibia medially, T1 mediobasally, posterior margin of T1, anterior and posterior margin of T2, anterior margin of T3 and ovipositor; the following brown: antenna except medially, hind coxa apico-ventrally, hind trochanter and femur, hind tibia basally and apically, hind basitarsus basal $1/3^{\text{rd}}$, venation, pterostigma, hind basitarsus apically, hind tarsus 2–3, tarsal claw brown; and the following white: antenna medially, medial tarsomere 4–5, hind basitarsus apical $2/3^{\text{rd}}$, hind tarsomere 2–5.

Variation. In paratypes from Doi Pha Luang antenna with 39 flagellomeres, occiput more strongly concave, area superomedia with transverse carina more strongly arched posteriorly. Clypeus completely black except apically, metapleuron and anterior part of propodeum black, T2 baso-laterally black.

Male. Same as female except the following characters; Clypeus transverse, $3.2 \times$ as long as wide, clypeal margin protruding anteriorly (Fig. 5A). Scape $1.4 \times$ long as its maximum width (Fig. 5A). Face transverse, flat, shallowly punctate with shagreen matt interspace, setose, $1.6 \times$ as long as wide. Malar space $0.3 \times$ as long as basal width of mandible. Lower tooth of mandible $1.8 \times$ as long as upper tooth. T1 $1.5 \times$ as long as its maximum width. T2 $0.6 \times$ as long as its maximum width (Fig. 5B). Posterior margin of S4 and S6 rounded, of S5 straight (Fig. 5C). Apex of paramere elongate, its margin round (Fig. 5C). Inner margin of ventral side of paramere parallel at base (Fig. 5C). Tip of aedeagus swollen, decurved, its apex rounded. Yellow colored areas relatively larger than in female, those face and clypeus completely, mesopleuron, middle part of T1 between latero-median carina yellow.

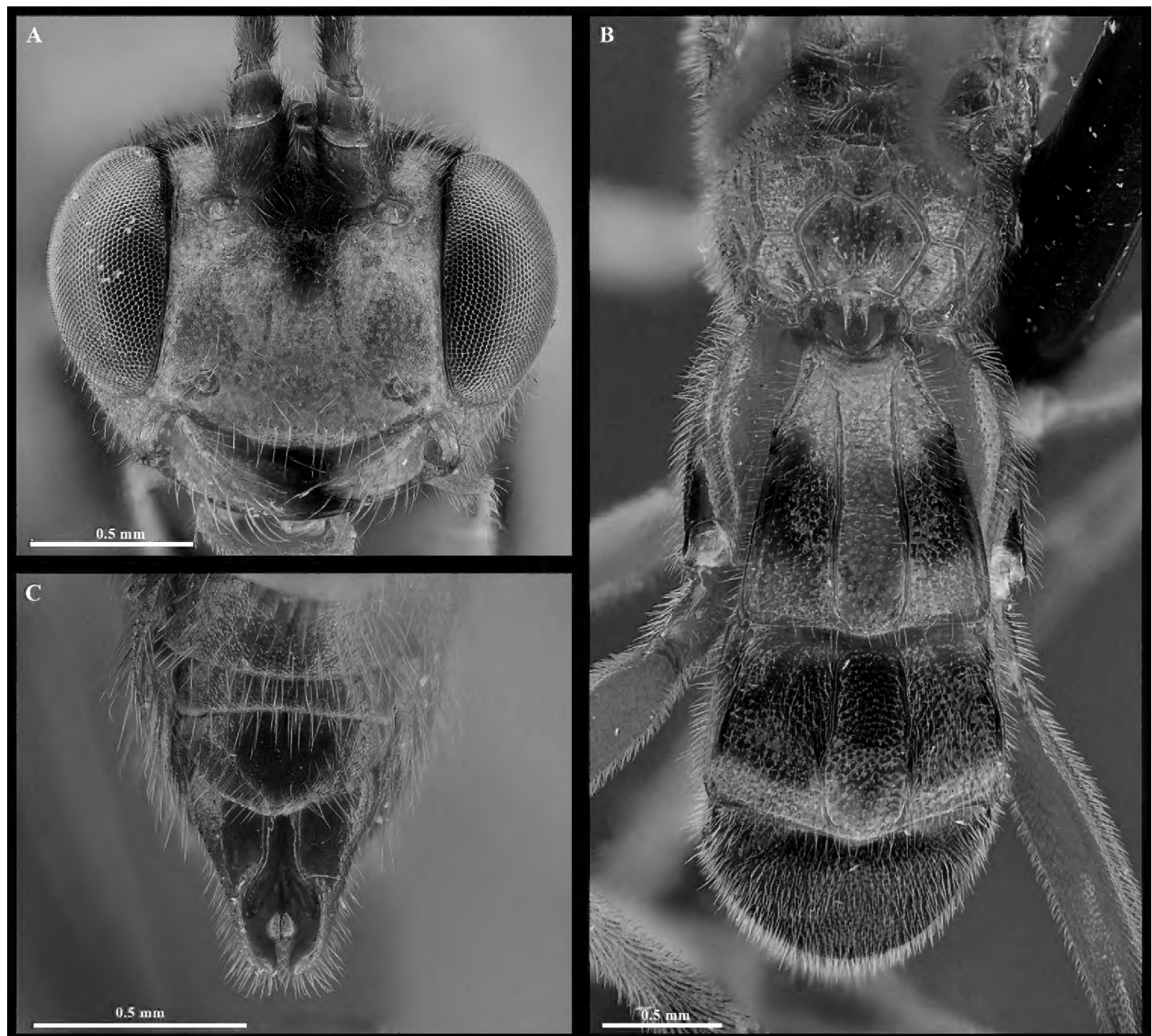


Figure 5. *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke, gen. et sp. nov., paratype, male **A** head, anterior view **B** propodeum and T1–3 dorsal view **C** S4–6 and male genitalia ventral view.

Biology. Unknown.

Etymology. The species is named after the magnificent combination of morphological characters which are completely unknown from the members of the subfamily.

Distribution. Thailand.

Discussion

The complete lateral longitudinal cartina of T2 is one of the diagnostic characters used by Townes (1970) to recognise the Ctenopelmatini, although this character state is also present in several species in the genera *Hadrodactylus* Förster, 1869 (Euryproctini) and *Rhorus* (Pionini). However, in members of the Ctenopelmatini, T8 of the female is produced posteromedially between the base of the ovipositor sheath and the cercus whereas in *Thaictenopelma* gen. nov. T8 apical margin is normal. Further, the

carination pattern of T1 and T2 disagrees with a placement in Ctenopelmatini as all carinae (dorso-lateral and latero-median) are extended up to the posterior margins of the tergites. The complete propodeal carination of *Thaictenopelma* gen. nov., including a completely defined area superomedia, is a putatively plesiomorphic character state found in the Pionini Smith & Shenefelt, 1955 (most genera) and Perilissini Thomson, 1883 (*Lathrolestes* Förster, 1869 and *Perilissus* Förster, 1855), and only a few ctenopelmatines (*Austropion* Gauld, 1984, *Hodostates* Förster, 1869, *Glyptorhaestus* Thomson, 1894, *Phaestus* Förster, 1869, *Petilium* Townes, 1970, *Lathrolestes* and *Perilissus*) (Townes 1970; Gauld 1984, Gauld et al. 1997).

The new genus appears most similar to the pionine, *Austropion* from Australia (Gauld 1984), but *Thaictenopelma* gen. nov., which also has the ovipositor with a distinct (albeit shallow) pre-apical dorsal notch (Suppl. material 2), but can be clearly distinguishable from *Austropion* by a combination of following characters; the lower tooth of the mandible longer than the upper tooth (upper tooth longer than lower tooth in *Austropion*), the occipital carina complete (obsolescent in *Austropion*), the fore wing areolet broad basally (petiolate in *Austropion*), T1 with complete dorso-lateral carina (carina absent in apical half in *Austropion*), T2 with a pair of complete latero-median and dorso-lateral carinae (smooth without carinae in *Austropion*), and the ovipositor without an acute dorsal process (with acute dorsal process in *Austropion*). Gauld (1984) placed *Austropion* in the Pionini based on carination but noted that it was rather aberrant. The only other genus traditionally placed in the Pionini with an ovipositor notch is *Hodostates* Foerster, 1869, and based on this character, Cameron et al. (2011) stated that they “... are confident in rejecting *Hodostates* from Pionini”, but the combined molecular and morphological analyses of Quicke et al. (2009) recovered *Hodostates* deeply nested among other Pionini genera and thus it appears that a notched ovipositor is likely to be homoplastic within the subfamily as noted by Cameron et al. (2011).

Thaictenopelma gen. nov. is also similar to the *Priopoda* group of genera (Perilissini) by having the occipital carina joining with hypostomal carina at base of mandible (Fig. 2B, Suppl. material 2). Within *Gilen*, *Neurogenia*, *Priopoda* Holmgren, 1856 and *Lathrolestes*, the new genus is most closely resemble *Gilen* by having T2–3 with a broad sub-apical transverse impression and T2 lateral longitudinal carina but readily discriminate by lacking produced mid-longitudinal facial projection and having distinct complete latero-median carina of T2.

Due to the presence of rather mixed combination of morphological characters displayed in different tribes (Ctenopelmatini, Perilissini and Pionini) we refrain from assigning the new genus to any of the extant tribes and we prefer to keep it as *incertae sedis* within the Ctenopelmatinae, although on balance it seems most probable that belongs to the Perilissini. Similar conditions have been found in a couple of genera like *Labrossyta* Förster, 1869 and *Hodostates* (Townes 1970). All these strongly point to the need for comprehensive analyses of the tribal classification of the Ctenopelmatinae.

Finally, at the only two known localities, the new species seems either to be very uncommon or not to get collected easily in Malaise traps, since we only found seven individuals from more than 600 Malaise trap months' (>50 years) of sampling.

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Supplementary material 1

Type locality of *Thaictenopelma splendida* Ranjith, Reshchikov & Quicke gen. et sp. nov.

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Supplementary material 2

***Thaictenopelma splendida* Ranjith, Reshchikov & Quicke gen. et sp. nov.**

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